Fabrication of thin conductive films made up of SWCNT aqueous inks through green approaches.

Miguel A. Álvarez-Sánchez[1], José Miguel González-Domínguez[1], Alejandro Ansón-Casaos[1], Ana M. Benito[1], Wolfgang K. Maser[1]

[1]Instituto de Carboquímica, CSIC, Miguel Luesma Castán 4, E-50015, Zaragoza, Spain.
maalvarez@icb.csic.es

Conductive inks development is currently a field of study for electronic applications, including energy devices and sensors, where metal nanoparticles (MNPs) have most commonly been used. However, MNPs present important disadvantages, typically the scarcity of noble metals (Au, Ag, Pt) and the easy oxidation of the rest (Cu, Al). Carbon nanomaterials, such as single-walled carbon nanotubes (SWCNTs), are regarded as an alternative for the fabrication of conductive inks, because of their properties: electronic and thermal conductivity, 1D structure, surface functionalization, and the dispersion in many surfactants and some organic solvents, which are unfortunately highly toxic and unsustainable.[1]

New biofriendly and sustainable dispersing agents are on demand, and also the use of water as the liquid medium for conductive inks. Nanocellulose, an emerging 'green' nanomaterial, posseses many desirable features: hydrophilicity, sustainability, abundance and exellent performance as dispersing agent, which makes it a promising candidate as an alternative to toxic surfactants and hazardous organic solvents.[2] Herein, we report the facile, non-toxic and environmentally friendly fabrication of aqueous and stable conductive inks made up of SWCNTs, using nanocrystalline cellulose as dispersant agent (Figure 1).[3] The conductive ink was deposited by optimized spray coating techniques to fabricate the thin films, which were characterized in terms of electrical properties.

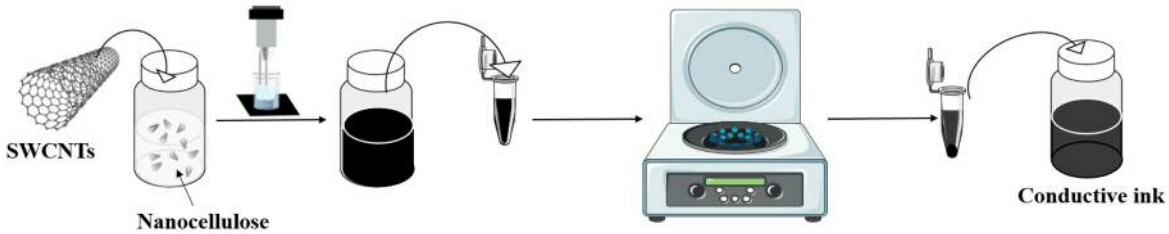

***Figure 1**. Fabrication of conductive inks made up of SWCNTs and Nanocellulose as dispersant agent.*

References

1.K. Pan, et al. Nature Communications, 9, 5197 (2018)
2. A. Hajian, et al. Nano Lett, 17, 1439-1447 (2017)
3. J. M. González-Domínguez et al. *In revision* (2019)

Acknowledgements: Spanish MINEICO (Project ENE2016-79282-C5-1-R, AEI/FEDER, UE) and Government of Aragon (Grupo de Referencia DGA-T03_17R, FEDER, UE)